Trend Study 16C-22-04

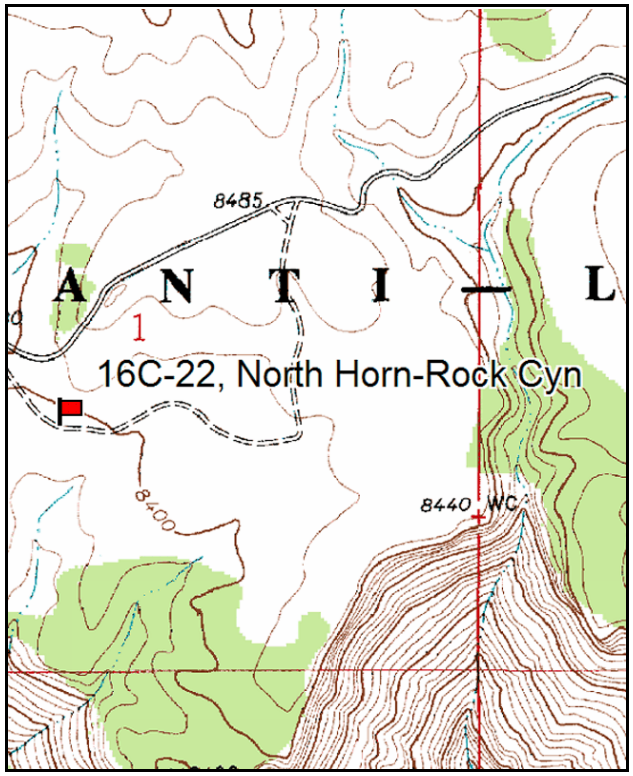
Study site name: North Horn-Rock Canyon . Vegetation type: Mountain Big Sagebrush .

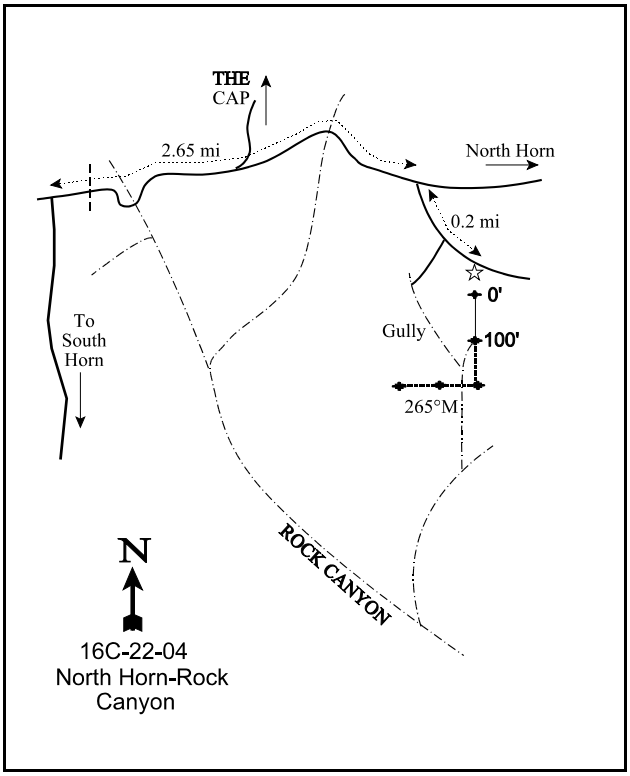
Compass bearing: frequency baseline 173 degrees magnetic-lines 1 & 2; 265 degrees magnetic-lines 3 & 4.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of the North Horn and South Horn roads, continue on the graded North Horn road. Go 0.8 miles and cross the upper end of Rock Canyon. Continue on main road 1.85 miles to a small fork. Bear right onto the dirt road (#130), and proceed 0.2 miles to a witness post on the right hand side of the road. The frequency baseline starts 40 feet south of the tall witness post. The 0-foot baseline stake is marked by a red browse tag #9008.





Map Name: The Cap ,

Township l9S , Range 6E , Section 1

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4338260 N, 482827 E

DISCUSSION

North Horn-Rock Canyon - Trend Study No. 16C-22

The North Horn-Rock Canyon study is located in a small basin at the head of Rock Canyon. The Rock Canyon drainage is a migration route from the high elevation range on North Horn and South Horn mountains down to pinyon-juniper and desert shrub winter range. The range type at the study site is sagebrush/grass, containing a mixture of mountain big sagebrush and black sagebrush with scattered mountain brush on the hillsides. Ponderosa pine, pinyon, and juniper trees are found in the drainages and along the canyon edge. The site has a southwest aspect on a slope that varies from 3-5% with an elevation of 8,400 feet. The small basin has never been terraced or seeded. The study site shows evidence of moderate to heavy use from both deer and elk. Cattle sign is relatively infrequent, possibly because grasses are more limited here than on surrounding terraced and seeded areas. Pellet group data from 1999 estimate 13 elk, 29 deer, and 15 cow days use/acre (32 edu/ha, 72 ddu/ha, and 37 cdu/ha) Pellet group data from 2004 estimate 66 elk, 38 deer, and 9 cow days use/acre (164 edu/ha, 94 ddu/ha, 23 cdu/ha). Most of the cattle pats were from the previous season.

Sandstone bedrock is exposed near the canyon edge. Up the slope where sagebrush dominates, the soil appears to be relatively shallow. There are some more shallow spots of underlying bedrock favoring the more shallow rooted black sagebrush. Effective rooting depth is estimated at a little over 12 inches over the site. The sandy clay loam soil has a fairly high concentration of pavement and rock fragments in upper horizons and on the surface. Phosphorus is low at 5.5 ppm, where values less than 10 ppm can limit normal plant growth and development. Bare ground is fairly abundant in the shrub interspaces, but there is little erosion occurring on the site.

A mixture of mountain big sagebrush and black sagebrush provides most of the forage on this site. Some individuals were difficult to identify and are most likely hybrids. Black sagebrush is more numerous and provided 50% of the shrub cover in 1994, 44% in 1999, and 40% in 2004. Percent decadence was moderately low at 24% in 1994, 22% in 1999, and has increased slightly to 35% in 2004. An increasing proportion of the these decadent shrubs have been classified as dying, rising from 18% in 1994 to 55% in 2004. Recruitment was abundant at 1,780 seedling/acre in 2004, but differentiating between some of the black sagebrush and mountain big sagebrush was difficult. Hedging on black sagebrush continues to be light to moderate.

Mountain big sagebrush provided 25% of the shrub cover in 1994 and 26% in 2004. Density has dropped since 1999 with 2,520 plants/acre compared to 2,040 plants/acre in 2004. Seedling production was high this year at 500 seedlings/acre. Hedging has been light to moderate in the past, but has increased to moderate to heavy hedging in 2004. Vigor is normal on most plants, yet percent decadence is high and has remained high since 1988 at an average of 41%. Decadent shrubs that were classified as dying declined since 1999 at 40% to 29% in 2004.

The site supports two species of rabbitbrush, dwarf (*Chrysothamnus depressus*), and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*). All of the rabbitbrush was called dwarf rabbitbrush in 1988 and 1994, but most of the rabbitbrush is actually stickyleaf low rabbitbrush. Dwarf rabbitbrush had a population density of 1,320 plants/acre in 1999 and decreased to 1,240 plants/acre in 2004. These shrubs are very low growing, averaging only 3 inches in height. Use was light to moderate and vigor good with percent decadence low. Stickyleaf low rabbitbrush is much more numerous at an estimated 7,700 plants/acre in 1999 and increased to 7,920 plants/acre in 2004. These plants are mostly mature and unutilized. Other palatable browse species include Utah serviceberry and antelope bitterbrush, although these species occur infrequently.

Grasses on average compose a majority of the herbaceous understory (90%). Western wheatgrass, muttongrass, and blue grama are the dominant grass species on this site. Bottlebrush squirreltail and needle-and-thread grass were common in 1988 but have nearly disappeared from the site. Salina wildrye was picked

up in the 1999 sample and has remained stable in 2004. A variety of low-growing forbs were sampled, but they do not provide much forage due to their low numbers.

1994 TREND ASSESSMENT

Relative percent bare ground has increased from 35% to 42%. Over half of the vegetative cover is from browse with the rest coming from grasses. Soil trend is considered stable, for the slight increase in bare soil is not enough to warrant a change in trend. Key browse are mountain big sagebrush and black sagebrush. This appears to be a marginal site for mountain big sagebrush evidenced by mountain big sagebrush having nearly the same stature as black sagebrush. The mature mountain big sagebrush population declined by 41%, while the black sagebrush population declined by 54%. Most of these declines would be due to the much larger sample size utilized in 1994 which now gives much more accurate browse densities. Due to the dry conditions, very few seedling or young were encountered in 1994 for either species. Browse trend is slightly down. Summed nested frequency for perennial grasses and forbs decreased since 1988 leading to a slightly down herbaceous trend. The Desirable Components Index (see methods) rated this site as poor with a score of 40 due to moderate shrub cover, no young shrubs, and fair perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 40 (poor) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil appears to be stable. Percent cover of bare ground has declined with pavement cover increasing and litter cover declining slightly. Trend for browse is also stable for the time being. The black sagebrush population has increased slightly and percent decadence has declined from 24% to 22%. However, reproduction is still poor with few seedlings and young plants encountered. Another negative aspect of the black sagebrush population is an increase in the proportion of decadent plants which appear to be dying (from 18% to 28%). There is currently not enough young plants to maintain the population. If recruitment does not improve in the future, the population will most likely decline. Density of mountain big sagebrush declined slightly since 1994. Utilization is similar to 1994 levels, but the proportion of shrubs displaying poor vigor have increased. Percent decadence is high at 48%, a slight increase from 1994. In addition, the proportion of decadent plants classified as dying has increased from 29% to 40%. Recruitment for mountain big sagebrush is also inadequate to maintain the current population. Dwarf rabbitbrush is abundant and provides some additional forage. During the 1999 reading, most of what was called dwarf rabbitbrush (*Chrysothamnus depressus*) was actually stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*). The dwarf rabbitbrush displays moderate to heavy use while the stickyleaf low rabbitbrush is not utilized. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses and forbs. Nested frequency of western wheatgrass declined significantly whereas frequency for mutton bluegrass increased significantly. Forbs are diverse but produce less than 2% cover. The Desirable Components Index rated this site as fair with a score of 54 due an increase in perennial grass cover, an increase in young shrubs, but still high decadency.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 54 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Percent of bare ground has increased slightly, but not enough to permit a downward change in trend. Pavement and rock cover, and vegetation/litter cover remains fairly stable. Trend for browse is down slightly. Since 1994, the density of mountain big sagebrush has continued to decrease from 2,940 plants/acre in 1994 to 2040 plant/acre in 2004. Seedling reproduction was high in 2004, but many showed signs of dying due to lack of moisture. Young plant recruitment (40 plants/acre) is not enough to compensate for the portion of decadent plants that are classified as dying (238 plants/acre). The density of decadent mountain big sagebrush plants has decreased, but the density of dead plants has increased. Utilization increased to moderate and heavy use. The percentage of plants that are decadent continues to be high (40%). Black sagebrush density has decreased from 5,580 plants/acre in 1999 to 4,620 plants/acre in 2004. Seedling production was very high, but were lacking moisture. Young recruitment (80 plants/acre) is low and is not producing enough plants to compensate for the decadent plants (880 plants/acre). Over one-half (55%) of the decadent black sagebrush plants classified as dying. Density of low rabbitbrush continues to decrease, while the density of stickyleaf low rabbitbrush continues to increase. Trend for herbaceous understory is considered stable. There was a slightly decrease in strip frequency of western wheatgrass and mutton bluegrass, but it was not significant. Forbs still have low production of less than 2% cover. The Desirable Components Index (see methods) rated this site as fair with a score of 54 due to an increase in shrub cover, a decrease in young shrubs, and still high decadency.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 54 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 22

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	bc206	c217	ab173	a135	4.14	3.12	2.78
G	Agropyron spicatum	-	-	-	4	-	-	.21
G	Bouteloua gracilis	66	93	90	98	1.56	2.65	3.67
G	Elymus salina	a-	a-	c74	b52	-	1.41	1.04
G	Oryzopsis hymenoides	a-	ab5	ab5	b11	.07	.16	.61
G	Poa fendleriana	a89	ab109	b131	ab100	1.37	3.34	2.25
G	Poa secunda	-	4	3	4	.03	.00	.01
G	Sitanion hystrix	b85	a3	a27	a26	.00	.67	.29
G	Stipa comata	c47	ab1	a-	b14	.00	.00	.16
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		493	432	503	444	7.19	11.38	11.05
Total for Grasses		493	432	503	444	7.19	11.38	11.05
F	Allium spp.	3	-	-	-	-	-	-
F	Androsace septentrionalis (a)	-	-	4	-	-	.03	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Antennaria spp.	-	1	-	-	.03	-	-
F	Arabis spp.	1	1	-	-	.00	-	-
F	Astragalus convallarius	-	2	-	-	.00	-	-
F	Astragalus spp.	-	3	2	-	.00	.03	-
F	Castilleja linariaefolia	$_{b}$36	$_{a}$4	$_{a}$3	$_{a}$-	.03	.00	-
F	Chaenactis douglasii	$_{b}$19	$_{a}$-	$_{b}$18	$_{a}$-	-	.16	-
F	Chenopodium leptophyllum(a)	-	-	-	1	-	-	.00
F	Crepis acuminata	$_{c}$22	$_{a}$-	$_{b}$6	$_{bc}$8	-	.10	.13
F	Cryptantha spp.	-	2	-	4	.00	-	.16
F	Eriogonum alatum	-	-	1	-	-	.00	-
F	Erigeron eatonii	$_{ab}$7	$_{bc}$24	$_{c}$26	$_{a}$-	.13	.16	.00
F	Erigeron pumilus	7	4	3	4	.01	.01	.03
F	Eriogonum racemosum	14	13	23	23	.04	.29	.23
F	Eriogonum umbellatum	-	-	2	2	-	.03	.15
F	Gayophytum ramosissimum(a)	-	$_{a}$-	$_{a}$-	$_{b}$17	-	-	.04
F	Haplopappus acaulis	$_{a}$4	$_{b}$12	$_{a}$-	$_{a}$1	.18	-	.03
F	Hymenoxys acaulis	-	-	-	5	-	-	.06
F	Ipomopsis aggregata	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$-	-	.03	-
F	Lappula occidentalis (a)	-	-	-	8	-	-	.01
F	Lupinus argenteus	-	-	7	5	-	.06	.03
F	Machaeranthera canescens	$_{b}$31	$_{ab}$11	$_{ab}$16	$_{a}$3	.02	.09	.03
F	Penstemon spp.	-	1	-	-	.01	-	-
F	Penstemon watsonii	2	7	6	8	.02	.05	.09
F	Phlox austromontana	$_{b}$18	$_{a}$3	$_{ab}$11	$_{ab}$11	.01	.39	.07
F	Phlox longifolia	-	-	-	5	-	-	.01
F	Polygonum douglasii (a)	-	-	-	18	-	-	.03
F	Senecio multilobatus	$_{ab}$29	$_{a}$6	$_{b}$49	$_{b}$41	.01	.24	.32
F	Sphaeralcea coccinea	1	-	-	-	-	-	-
F	Trifolium spp.	-	-	1	3	-	.00	.03
F	Unknown forb-perennial	1	-	2	-	-	.00	-
Total for Annual Forbs		0	0	4	44	0	0.03	0.10
Total for Perennial Forbs		195	94	188	123	0.52	1.69	1.41
Total for Forbs		195	94	192	167	0.52	1.72	1.51

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 16C, Study no: 22

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	0	2	1	-	.03	.15
B	Artemisia nova	74	76	73	7.72	8.48	9.07
B	Artemisia tridentata vaseyana	71	58	57	3.87	4.39	5.97
B	Chrysothamnus depressus	85	41	38	3.50	.64	.79
B	Chrysothamnus viscidiflorus viscidiflorus	0	81	89	-	5.10	5.85
B	Gutierrezia sarothrae	22	34	23	.16	.52	.22
B	Pediocactus simpsonii	1	3	2	.03	.03	-
B	Pinus edulis	0	2	2	-	-	-
B	Purshia tridentata	0	5	4	-	.30	.53
B	Symphoricarpos oreophilus	0	1	1	-	-	-
Total for Browse		253	303	290	15.29	19.51	22.60

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 22

Species	Percent Cover '04
Artemisia nova	10.08
Artemisia tridentata vaseyana	5.78
Chrysothamnus depressus	.71
Chrysothamnus viscidiflorus viscidiflorus	6.34
Gutierrezia sarothrae	1.50
Pinus edulis	.08
Purshia tridentata	.95

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 22

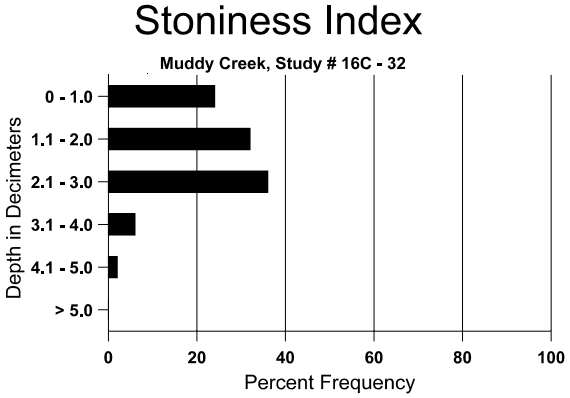
Species	Average leader growth (in) '04
Artemisia nova	1.0
Artemisia tridentata vaseyana	2.0
Purshia tridentata	3.6

BASIC COVER --
Management unit 16C, Study no: 22

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	6.25	23.82	32.56	35.23
Rock	.25	5.92	2.12	3.84
Pavement	12.25	2.67	11.30	8.62
Litter	45.00	20.31	16.80	21.46
Cryptogams	1.50	2.53	4.10	2.96
Bare Ground	34.75	40.54	35.50	43.04

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 22, Study Name: North Horn - Rock Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.3	49.3 (8.3)	7.2	60.4	17.8	21.8	1.7	5.5	73.6	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 22

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	28	18	18
Elk	23	12	48
Deer	16	12	4
Cattle	-	3	2

Days use per acre (ha)	
'99	'04
-	-
13 (32)	66 (164)
29 (72)	38 (94)
15 (37)	9 (23)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**533**	-	200	333	-	-	50	25	0	-	0	19/12
94	**0**	-	-	-	-	-	0	0	0	-	0	14/14
99	**40**	-	-	20	20	-	0	100	50	50	50	24/40
04	**20**	-	-	20	-	20	0	100	0	-	0	12/16
Artemisia nova												
88	**11266**	400	933	6200	4133	-	6	.59	37	.53	12	7/11
94	**5160**	40	-	3940	1220	180	16	2	24	4	4	9/19
99	**5580**	20	120	4260	1200	180	25	11	22	6	6	7/17
04	**4620**	1780	80	2940	1600	480	19	.43	35	19	21	7/19
Artemisia tridentata vaseyana												
88	**5132**	466	866	2600	1666	-	21	12	32	.38	8	10/15
94	**2940**	20	40	1540	1360	140	31	2	46	14	14	9/20
99	**2520**	20	100	1220	1200	240	35	21	48	19	19	11/24
04	**2040**	500	40	1180	820	540	56	29	40	12	16	12/27
Chrysothamnus depressus												
88	**6332**	600	866	4866	600	-	18	3	9	-	4	3/6
94	**6900**	-	280	6600	20	-	12	3	0	-	0	3/8
99	**1320**	-	80	1160	80	-	33	33	6	2	2	3/7
04	**1240**	-	20	1100	120	-	16	15	10	2	3	4/9
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**7700**	-	400	6820	480	-	0	0	6	-	0	5/11
04	**7920**	80	520	7300	100	160	.25	0	1	.75	.75	5/11
Gutierrezia sarothrae												
88	**399**	-	133	266	-	-	0	0	-	-	0	6/7
94	**960**	-	100	860	-	20	0	0	-	-	0	4/23
99	**2020**	-	60	1960	-	-	0	0	-	-	0	6/8
04	**1040**	-	40	1000	-	20	0	0	-	-	0	6/8
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	2/2
99	**80**	-	-	80	-	-	0	0	-	-	0	3/4
04	**40**	-	-	40	-	-	0	0	-	-	0	2/4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**40**	-	40	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	7/53
99	**200**	-	-	200	-	-	20	80	-	-	0	10/52
04	**100**	-	-	100	-	-	0	100	-	-	0	10/36
Symphoricarpos oreophilus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	6/10